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CONTENTS

ERI SILK WORM REARING AS A COTTAGE INDUSTRY IN SOUTHERN INDIA. Part II.

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Suggestions for Rearing Eri Worms. Now that we have had some ideas of the general characteristics and life history of the eri silk worm let us see what are the necessary requisites for one who wishes to start the rearing. Since the main idea in such attempts is to rear the worms for good cocoons yielding the proper quantity and quality of silk which will fetch a decent price, one should exercise some fore-thought as to the previous arrangements and conditions necessary. At the very beginning one should not be over-ambitious and start on a large scale; it is always better to try on a small scale and gradually increase the work after judging the results of the early trials. The very idea of a cottage industry is to enable a poor family to derive some extra income by providing some home industry for the family folk during their spare hours when they are not engaged in their more important avocations.

Essential pre-requisties. The important things one has to be provided with before starting the work are (1) a supply of castor leaves for food, (2) a convenient place for housing the worms and (3) the necessary rearing appliances.

Food. At least two months before starting rearing, arrangements should be made to have a plot of land properly prepared and sown with castor seed so that the plants will be in a fit condition in about 8 or 10 weeks to supply the food for the worms. As to how much of castor one should grow depends upon the capacity of the party to breed a small or big brood of worms. Approximate estimate may be found in the following paragraph under facts and figures. For trial purposes a few cents will be found quite sufficient at the beginning Trials made to feed the worms in different stages with one or two other food plants * have not proved successful so far, though in Assam the insect is said to be kept on thriving on some other leaves when the usual food plant is not available in sufficient quantity.

Rearing house or shed. To rear the worms on a small scale no special house is necessary; any fairly well ventilated room with thatched roof and with clean walls and flooring will be found quite satisfactory; portions of dwelling houses which are not dusty and ill ventilated may also be used for the purpose. Persons wishing to do the rearing on a fairly large scale may put up separate thatched sheds at a fairly cheap cost.

Rearing appliances. These consist of bamboo trays for keeping the seeds and worms, some bamboo baskets for putting in the ripe worms for cocoon spinning and storing castor leaves and a shelf or two for keeping the rearing trays. A four sided tray will be found more convenient than a circular one and the convenient size will be 3′ length by 2′ breadth. These are generally of bamboo matting with the edges turned up to an inch and a half or two. Each of these trays will hold three to four hundred ripe worms (those of the last stages). These trays may also be used for keeping the eggs for hatching. It is always better to have the rearing trays with the worms kept on a shelf or rack. Such racks used for silkworms in Kollegal and Mysore are known as *Dhada* or *Meja* (evidently a corrupt form of the N. Indian *Machan*). Each of such meja is a bamboo frame-work generally made up of four or six upright posts of medium sized strong bamboo poles arranged in two or three pairs and each pair connected by small cross-pieces; these are connected by means of 20 or 24 horizontal cross pieces 10 or 12 attached along the front side and the same number to the back thus making two vertical rows giving room for 10 or 12 trays in each row. The height of the shelf usually depends upon the number of shelves provided for each vertical row. The most important thing with regard to the tray stand is that there should be plenty of room between one try and another in the vertical row.—not less than 9″ of space should be provided for between shelf and shelf. The legs of the row, may be inserted inside ant pans containing water

* The other food plants used in Assam are *Heteropanax fragrans, Jatropa curcas* and *Gmelina arborea*.

which will prevent ants going up the stand. The baskets for cocoon spinning may be the ordinary fruit baskets a foot or foot and a half deep and of the same diameter and provided with a lid. Two such baskets will be sufficient for putting in about a thousand worms for cocoon spinning. The above are the important things one should keep ready before starting the work.

Starting of Rearing. By the time the essential requisites such as food, housing arrangements and rearing appliances are got ready a supply of good seeds—eri eggs may be arranged for. It is always advisable to get seeds in the shape of eggs to start rearing and not live cocoons as is sometimes done in the case of the mulberry silkworms; there is a risk of introducing the fly parasite when cocoons are got instead of eggs. It is better to start the rearing after the hot weather has subsided, about July—August and suspend the rearing for two or three months during the hot weather in places where the heat and dryness are severe. When the seeds are received and if they are guaranteed by the supplier to be sound they can be spread out in a rearing tray without any treatment and kept for hatching. In dry hot weather some moisture is necessary for successful hatching and the tray with the eggs may be kept covered with a wet piece of cloth. Eggs should never be kept or forwarded to any one in any airtight or closed container. As the hatching time approaches the eggs turn dark grey and at this stage bits of tender castor leaves should be spread over them so that the young worm that hatches from each egg can immediately crawl along and reach its food. Eggs of the same age should be kept together so that uniform hatching may be got and similarly worms hatching on different dates should not be kept together in the same tray. A few hours after hatching, the leaves with the tender young worms clinging on to them may be transferred to a fresh tray.

Feeding and care of the worms. The worms should be fed with bits of tender castor leaves twice a day and in dry weather it may be found necessary to supply fresh food once more; during the hot weather the trays containing the young worms may be kept covered with a wet piece of cloth preventing the leaves from drying up. During the moulting periods when the worms are weak and sluggish feeding can be temporarily suspended until they have completely finished the moult. The number of feeds per day may be increased from two to three after the first moult and from three to four or five after the third moult. After the fourth moult when the worms feed voraciously food supply should be increased to five or six times per day and once or twice at night; they should be fed very well during this ripening stage. Castor leaves should as far as possible be fresh and never dusty or wet; the feeding of worms with unclean or moist foliage will bring on disease and mortality among the worms. The usual custom is to give young leaves to young worms and feed the ripening worms with

bigger and thicker foliage. When the ripe worms begin to stop feeding and wander away from the tray, food supply can be stopped and the worms transferred to the baskets for spinning cocoons.

The whole success or failure of the industry depends mainly on the proper care and treatment of the worms. Apart from the attention to be paid to the food and the feeding of the worms as detailed above there are other points which also deserve proper attention. The housing, handling and general treatment of the worms should be done with some care. These worms are not to be housed in dingy, ill-ventilated, dusty and unclean rooms or in odd corners in dwelling houses where the atmosphere is always vitiated. When the weather is hot and dry the rearing room can be kept cool and moist by sprinkling water on the floor. As the worms grow in size more space should be given to them and they should not be crowded in the same tray; the more the space given to worms the healthier they grow and bigger the cocoons they spin. The gradual spreading out of the worms into more trays should be such that by the time they grow to their full size only about 300 worms occupy one tray. During the daily change of bed from tray to tray the worms should be transferred to clean trays with the fresh leaves to which they cling and very rarely should our hands be used in the operations. During the process any dead worms found in the tray should be removed with the old leaves and litter. It is extremely essential to keep the trays and surroundings clean and sanitary, and as such the daily accumulation of old leaves and litter from the trays should not be kept heaped in the vicinity, but should be removed far away from the rearing house.

Some Facts and Figures: Before concluding this brief account of the industry it may not be out of place to add a few facts and figures regarding the economic aspect of this subject since there is no doubt that prospective rearers would certainly be anxious to know something in this direction. The greater part of the information given below is based on the results of the work the writer has been carrying on in this direction many years ago; these estimates and approximate figures are by no means claimed as infallible since they are constantly influenced by various factors; and especially depend upon the quality of the cocoons produced at different seasons and the fluctuations in the market prices.

The number of cocoons and quantity of yarn produced—The number of pierced (unclean) eri cocoons which make up 1 lb. by weight has been found to vary between 1300 and 1600 according as the cocoons are better or lower quality—the average may be put down at about 1500. To get one pound of clean (reversed) cocoons, 1½ lbs. of pierced cocoons will be necessary, which means 2250 cocoons. It was found by actual spinning of the cocoons with a Pusa spinning wheel that 50 to 55 clean cocoons when boiled and spun give ⅓ ounce of silk yarn. In

other words about 4000 healthy worms are able to yield 1 lb. of silk yarn.

Capacity for production of the yarn—Let us now see how much of silk yarn a small family can produce, in other words, how many worms they can rear during their spare hours without in any way interfering with their more important bread-winning avocations. Though no actual trials were made in this way, with some past experience of eri worms and a fairly close acquaintance with the conditions in silk rearing villages of Kollegal and Mysore, the writer feels that a small family of two adults with an old person or boy to help them cannot conveniently manage rearing more than 7 to 8 thousand worms at each brood, that is, as many worms as would occupy 20 trays before cocoon spinning arranged in a rack of two vertical rows of 10 shelves each. And at this rate five broods can be reared in a year. If the conditions are favourable and the food supply become available it may be found possible to rear one more brood in the year; it is also possible that the family, after some experience, may be able to attend to more worms. With these possibilities a family may, after some time, hope to increase their income from this work. Five broods (5 × 8000) or 40,000 worms would yield at the calculated rate, about 10 lbs. of yarn. At a moderate rate these 10 lbs. would fetch Rs. 35 to 40. It is presumed that the whole work of rearing and producing yarn should be done by the family members only and not by paid labour. The initial cost of appliances may be roughly put down at Rs. 12 (including 20 trays at 4 annas, 18 baskets at 3 annas and a rack costing Rs. 3-8. In the case of cultivators in rural areas even these appliances could be arranged and improvised without much expenditure. The cost of food material (castor) is not included in the estimate as it is expected that a villager may make it available in his fields bunds and backyards without any special cost. As to how much of castor may be required for rearing a small brood as described above no correct data are available, though Braine says that 120,000 worms can be fed with an acre of castor for a whole year; according to this rate for five broods of 8000 worms each, 1/3 of an acre of castor appears necessary. This matter has to be worked out for confirmation by actual experiments in growing the plant and finding out the quantity of leaf that will be necessary to feed the number of worms that a small family is able to rear and the extra castor seeds that may be obtained in addition to the silkworm food; and incidentally the cost of production can also be worked out. It will, however, be seen that an annual income of Rs. 35 or 40 derived is not very much, but for a poor family an extra three or four rupees a month derived from a hobby will form a very good bit and will go a great way to meet any small extra wants of the family. Apart from this aspect, there is the help and stimulus these small rearers can give to this industry.

Conclusion:— In concluding this paper the writer wishes to emphasize the fact that though such estimates and figures may give some rough ideas to a beginner they cannot be considered final or universally applicable since as mentioned before there are several factors which influence these calculations. Any way it has been found by past experience that the eri silkworm can be grown successfully in many localities in S. India and that with mutual help and co-operation among the rearers the industry can be given a very good stimulus and gradually established on a sound footing. Since the chief idea of the paper is to give a very brief sketch of the subject dealing with the more important aspects of the industry, it has not been possible to deal with all the different sides of the subject in detail. For any detailed information on the subject, especially in the matter of the preparation of the yarn, dyeing, weaving of cloth, etc., the readers are requested to refer to the detailed account of *Eri silk* by Lefroy and Gosh published as a Pusa memoir in 1912. The writer is also prepared to give any further information he can on this subject, and can arrange to supply eggs also to those who are anxious to do some work in this direction.

CULTIVATION OF SENNA IN TINNEVELLY

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The Plant. Senna is locally known as *Nilavakai* or more commonly as *Aviri*. It belongs to the natural order Leguminoseae and the Tinnevelly variety of Senna is termed *Cassia aungustifolia*. It is a deep-rooted bushy plant growing to a height of 2 to 3 feet. The leaves are alternate and pinnately compound. The leaflets are in 5 to 9 opposite pairs 1½″ to 2″ long and lanceolate.

The crop stands a certain amount of drought and neglect but not water stagnation. It is not relished by cattle or goats; pests are few and there is no fear of any serious loss by theft.

Soils. The crop is grown round about Tinnevelly both under irrigated and rainfed conditions. Friable loamy soils in dry lands and sandy loams in wet lands are best suited. Red soil is always preferred to black as the yield and quality of the produce are poorer when the crop is grown on black soils.

Season. The crop requires good sunshine and occasional drizzling followed by dry weather. Heavy dew or continuous rains during the growth of the crop spoil the quality of the leaves. The rainfed crop is sown in November just after the heavy rains are over. The plant is left in the field generally for one season but when conditions

are favourable the crop is left for a second season also. In wet lands the crop is sown with the help of the summer showers from March to May. Here it is allowed to grow only for about 5 months since the land has to be cleared for the cultivation of paddy in September or October.

Rotation. The crop is grown pure once in three years in the dry land. Horse gram or green gram in one year and cowgram with *Samai Panicum miliare*) during the following year occupy the land in the interval. It is also sown as a mixture with gingelly. In wet lands it comes under rotation with paddy.

Manuring. While sheep penning is regularly followed by some ryots there are others who do not pay any attention to manuring at all. In wet lands the residual effects of organic manures applied to the previous paddy crop are considered sufficient for this.

Preparation of land and sowing. The land is ploughed four times before sowing. The seed is sown broad-cast or dibbled behind the plough. Seed rate varies from 4 to 8 Madras measures per acre according to the quality of the seed and fertility of the soil. Seeds obtained from a wet land crop is superior to the seeds produced from dry lands.

After cultivation. Weeding is done when the field gets weedy. When the crop is a month old a good hoeing with mammutty is given. After two months when flower buds appear they are nipped in order to stimulate the production of more leaves. In certain villages the nipping of the flower buds is not done as the growers think the pods produced are equally valuable. It is said that flowers produced after a new moon day set better seeds than those produced after the full moon.

Harvesting. The leaves as well as the pods have a commercial value. Harvesting of leaves commences after a period of three months from sowing in the case of dry lands and 2½ months in wet lands. The signs of maturity are the development of a dark green colour in the leaflets which become thick and brittle and break on folding. The leaflets are stripped from the plant gently without plucking the leaf stalks. This operation is generally done by women who collect the leaves on contract. When the crop can be irrigated or when it receives a good shower a second flush will be ready for harvest in three or four weeks.

Curing. The leaves as soon as they are gathered are spread on a clean hard floor in sheds or verandahs for drying in shade. Spreading should be done in such a way that the leaflets do not overlap. During rainy season if the harvest is done the leaves are first exposed to the sun light for about two hours turning them over twice or three times during this period. Then they are removed to the drying sheds and

dried in shade. Drying should not be overdone as the leaves get brittle. The loss in drying is estimated to be 50 to 75 per cent. by weight. After curing the stuff is filled in and pressed in gunny bags and stored.

Yield. This varies with the fertility of the soil, treatment and season. An ordinary crop of Senna in dryland will yield 300 lbs. of cured leaf while a good crop would produce upto 500 lbs. per acre and 75 to 150 lbs. of pods may be obtained. From a wetland crop 750 to 1,250 lbs. of cured leaf and 150 lbs. of pods are obtained. The price per candy (500 lbs.) of dryland leaf is Rs. 30 while that for wetland stuff is Rs. 60. The pods produced in wetlands are also valued at double the price offered for dryland produce. The average income from an acre of dryland may be estimated at Rs. 30 to Rs. 40 while from the wetlands Rs. 60 to Rs. 80 may be expected.

The cost of cultivation is Rs. 20 and Rs. 30 per acre for the dryland and wetland crops respectively.

Market. A firm near Tinnevelly (Messrs. Senneck & Co., Thalayuthu) purchases the stuff and grades it into five commercial classes by the grading machine. The graded commodity is pressed into bales and exported from Tuticorin. Messrs. Volkart Bros. are also dealing in senna and the produce is also taken by gunnies to Tuticorin for sale. It is shipped to merchants in Ceylon, America, United Kingdom Belgium, France, Germany and Italy through dealers at Tuticorin. The pods and leaves are valued commercially as they are utilised for the preparation of vegetable salts with purgative properties. It is also said that it is used in the preparation of the confectionery syrup and infusion of senna. The inferior quality is utilised for the preparation of dyes.

N. B.—Arrangements can be made to supply good senna seeds for intending growers on application to the Assistant Director of Agriculture, Tinnevelly.

GRAPE VINE CULTIVATION IN KRISHNAGIRI, (SALEM DISTRICT).

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Short History. It is not definitely known as to when and how grape vine was introduced here, but it is learnt that about a hundred years ago, at the instance of a French missionary, it was first tried at Melpatti, a village two miles to the north-east of Krishnagiri, which is chiefly inhabited by Maharatta military pensioners and their families. It is also said that subsequently one Mahomedan military man obtained a few cuttings of vines from Bangalore and propagated them in the yard of his house in Krishnagiri Town called " Old Town".

Anyway it is clear that grape vine cultivation was in existence even before 1880, when the Salem district manuals were compiled by Messrs. Leffanee and Richards.

Type and Variety. The grape vines grown in Krishnagiri taluk are of the green variety, the berries, of medium size, are round in shape and of fair sweetness and which at one time were considered the best in Southern India. There were no regular vineyards prior to 1910, the vines being grown in two's and three's in the kitchen gardens and in the compounds of villagers. It was between the years 1910 and 1926 that there was a steady increase in the area. It is said that there were nearly 250 gardens in Krishnagiri taluk, but the area is now reported to be decreasing and it is estimated that now there are not more than 200 gardens. The decrease is due to the fact that of late the yield and quality have declined, the juice being somewhat sour. The crop is further damaged by diseases such as "Mildew" and the prices have gone down by about 75%—from Rs. 10 to Rs. 2—8—0 per maund of 25 lbs. The gardens having become old and not being properly manured, do not yield as much as they did 15 years ago. As a matter of fact little or no manuring as such is done but a mixture of red earth and sand is put round the plants and dug in twice a year. In addition competition from North Indian grapes which are being imported to the South in large quantities is becoming keener especially after the introduction of the fast train "The Grand Trunk Express" from Peshawar to Madras.

Lay out and Methods of Cultivation. Generally good red loamy well drained soils of a friable nature are selected and pits 3 feet deep and 5 feet square are dug about 30 to 35 feet apart, i. e. about 40 pits to an acre. This is done usually in August—September before rains. The pits are filled in to 6" below ground level with a mixture of red earth and sand in the porportion of 1 : 2 to a depth of 2½ feet. Generally, planting is done in January about 3 months after digging of pits, for it is then that the pruning is done and cuttings will be available. Cuttings about 1½ feet long of 3 to 5 nodes are selected for planting. The selected cuttings are planted in the pits with two or three nodes underneath the earth and one or two nodes above. They later sprout and grow into vines and the roots grow from the nodes underneath the soil and spread in the pits. Sometimes instead of cuttings, grafts six months to one year old are planted, at the rate of one per pit. (Grafts cost about Rs. 1–8–0 each.) Six months after planting a *pandal* is erected. Till then the vines are supported by bamboo stakes but when trained over the *pandal* they form a dense net work. The pandal is erected either with wooden or stone uprights, (of late stone pillars have become very common) and bamboo reapers of varied dimensions. The pillars are planted 8 ft. apart and 6 ft. high above the ground level. Wooden posts are cheaper costing only 1½

annas each, whereas the stone pillars cost 3 annas each. About 500 pillars are required per acre. About 1000 small sized bamboo reapers at 25 per pit and 300 stout bamboo reapers are the requirements for putting up the pandal per acre. The small bamboo reapers cost Rs. 3 per 100 and stout reapers as. 2 each. The total cost of erecting a pandal is estimated at Rs. 180 per acre. The grapevines thus propagated from cuttings come into bearing only after the completion of the third year and those of grafts in a year or year and a half. But grafts are reported to deteriorate in yield after 8 or 10 years. Therefore planting cuttings is said to be preferable. From the time of planting till the vines come into bearing the buds are removed twice a year to arrest the formation of immature and small berries. Pruning is not done till after the first bearing and then every six months at the time of pruning, the garden is weeded and the pits are cleared. The earth round the vines in the pits is removed to a depth of about a foot and replaced by fresh earth and sand.

Pruning and Harvesting. Two crops are taken in a year, one in April and the other in September. Pruning is done twice a year in January and in July and this operation consists in the shortening of the shoots which bore fruits, leaving four or five buds. Watering is given daily twice to the pits (rainy days excepted) after planting till the time of first bearing. After the first harvest, the irrigation is stopped till the next pruning, i. e , about two months. The irrigation twice a day is renewed after pruning again till the crop is off. Sometimes, more particularly in summer, irrigation is given once a week during the fallow period also, i. e., after the crop is off and till the time of next pruning. At the time of pruning the whole garden is weeded and dug around the pits to a depth of about a foot, the earth round the pits is removed and a fresh mixture of red earth and sand applied. Irrigation is generally by a mhote from a well situated in or very close to the garden. Grapevines are said to thrive alike under both sweet and brackish water wells. The irrigation water is let into the pits around the vines and the pits serve as a basin to hold the irrigation water. The first crop or the summer crop is obtained in April after the pruning in January and the fruit obtained in this season is said to be better in quality and to fetch higher price (about Rs. 3 per maund of 25 lbs. on the average). The second crop or the rainy season crop is obtained in September and although the yield is said to be slightly greater and berries contain greater quantity of juice than the summer crop, yet the quality and taste are poorer and consequently fetch lower prices than the summer crop (about Rs. 2 per maund of 25 lbs.). Owing to the climatic conditions during the second season (September) the crop is more liable to damage from diseases like "Mildew" and consequently the money value is less.

The average cost of laying out and maintaining an acre of grape-vine garden of about 40 pits is shown below :—

I. Lay out and Planting.

Digging 40 pits at 0—4—0 a pit	Rs.	10—0—0
Carting sand and red earth—30 cart-loads of sand and 10 cart-loads of red earth at 0-10-0 a cart-load.	Rs.	25—0—0

*** Cost of planting material.**

Cuttings (sticks) at 2 to 4 per pit for 40 pits, average 120 sticks at 0—1—6 each ...	Rs.	11—4—0
Wages at 0—0—6 per pit for planting 40 pits. ...	Rs.	1—4—0
	Rs.	47—8—0

* If grafts are planted, each costs at 1—8—0 and will cost Rs. 60 per acre and so generally sticks are preferred on field scale..

II. Pandal erecting.

550 stone posts at 0—3—0 each (50 more are provided for breakages, misfits etc.,) ...	Rs.	103—2—0
1000 small bamboo reepers at Rs. 3 per 100 ...	Rs.	30—0—0
300 stout bamboo reepers at 0—2—0 each roughly.	Rs.	37—8—0
Wages for erecting the pandal per acre of 40 pits.	Rs.	10—0—0
	Rs.	180-10—0

III. Maintenance charges till bearing time.

Renewing the earth once in 6 months for 3 years, (6 times) inclusive of carting charges for sand and red earth, weeding etc. charges at Rs. 25 for each time (details calculated and lump sum provided) ...	Rs.	150—0—0
Total for items I, II & III.	Rs.	378—2—0 @

@ This excludes irrigation charges which cannot be calculated accurately but roughly it works out to Rs. 25 per month (2 bulls and 2 men for mhoting and irrigation) as under:—

Two men	Rs.	12—0—0	a month
Two bullocks ...	Rs.	12—0—0	-do-
Other mhoting articles ...	Rs.	1—0—0	-do-
Total ...	Rs.	25—0—0	-do-

Taking approximately that irrigation is necessary only for six months in a year and of this excluding all rainy days, the number of days works out to about 122 days in a normal year and it comes to Rs. 100 per year and for 3 years till bearing ... Rs. 300—0—0

Interest on the outlay :—

I year on Rs. 300 at 10% ...	Rs.	30—0—0	
II ,, on Rs. 450 at 10% ...	Rs.	45—0—0	
III ,, on Rs. 650 at 10% ...	Rs.	65—0—0	Rs. 140—0—0
Assessment at Rs. 2/- per year per acre for 3 years.			Rs. 6—0—0
		Total	Rs. 824—2—0

Thus the total investment will be about Rs. 825/- roughly for an acre of 40 pits of a grapevine orchard till the time of the first bearing.

Yields.

Summer or April flush in good seasons; about 135 maunds at Rs. 3 per maund	Rs.	400—0—0
In bad seasons about 50% of the good season's crop	Rs.	(200—0—0)
Rainy season or September flush :—		
In good seasons about 150 maunds at Rs. 2/- per maund.	Rs.	300—0—0
In bad seasons about 25% of the good season's crop only.	(Rs.	75—0—0)

Thus in good seasons, the yield will be :—

April crop	Rs.	400—0—0	Rs. 700 per year.
September „	Rs.	300—0—0	

In bad seasons :—

April crop	Rs.	200—0—0	Rs. 275 per year.
September „	Rs.	75—0—0	

Taking the average of good and bad seasons, the yield per acre per year for both crops works out to Rs. 487—8—0.

After the first year of bearing only irrigation charges of Rs. 100 per year plus Rs. 50 for pruning, weeding etc., are expended.

Thus the expenditure per year will be about ...	Rs.	150—0—0
Interest on the outlay on Rs. 825/- at 10% per year.	Rs.	82—8—0
Assessment per year at Rs. 2 per acre	Rs.	2—0—0
Total	Rs.	234—8—0

Thus the expenditure per acre is about Rs. 234—8—0

Net income per acre per year therefore is

Rs. 487—8—0 *minus* Rs. 234—8—0 = Rs. 253—0—0

Thus an acre of grapevine orchard containing 40 pits would fetch on the average normal crop a net income of about Rs. 250/- per year, which no other crop would give in this taluk. In very good years this figure may be considerably increased but in bad years it may be very largely reduced.

The first two or three crops after the first bearing will not be good but afterwards till the 15th year, very good yields are obtained. Gardens are kept on yielding even up to 40 years but after 15 or 20 years the yields generally go down.

What the Department has been doing to improve this crop in this taluk. In the years 1926 to 1930 as has already been stated, the area instead of increasing was reported to be going down in spite of the fact that this crop is the best money crop in the tract. Enquiries made in the year 1930, as soon as our work was started here, revealed that the owners are growing defident on account of the poor yields and low prices obtained for this crop; and so, many ryots are abandoning or not extending their orchards. Therefore it was found necessary to investigate the causes leading to such poor yields and low quality.

In 1931 discussions took place as to the means of increasing and improving crop yields and making it more paying. The root system of grape-vines was examined in two gardens and it was found that the root system extended to a distance of 10 to 15 feet, from the main stem of the plant and as such the root-lets are not able to utilise the water applied in the pits round the stem of the plants. Further it was ascertained that little or no farm yard manure and no artificial manures were being used on this crop. Therefore it was decided to conduct trials on grape-vines as follows:—A basal dressing of farm yard manure at 40 lbs. per pit was applied to all pits.

I. By changing the method of watering from pit to bed system, the whole area being watered as in the case of garden crops in beds.

II. By the application of the following dose of artificials:—

Dose:—

Sulphate of Ammonia,	...	¼ lb.	Total of 3½ lb. per pit or vine.
Sulphate of Potash,	...	¼ lb.	
Bonemeal ...	...	1 lb.	
Groundnut cake, ...	...	2 lb.	

Accordingly in January 1932, just when pruning was done, trial plots were laid out for both these trials in Mr. K. Venkatrama Chettiar's gardens, near Dowlatabad. The number of pits experimented was 14 only. The experiments were conducted as follows:—

I. Four pits with artificials spread over the whole area and dug in and irrigated in beds.

II. Four pits with bed irrigation only.

III. Three pits with artificials applied in pits round the stem and watered in the pits only, as is done here.

IV. Three pits—local method—control—local method of renewing sand and red earth and irrigation in pits.

The harvesting was done in April 1932. The results of the trial are tabulated in the statements A and B appended. From the experiments it was found that the profit in the bed system of irrigation alone worked out to Rs. 1—5—8 per pit and with the artificials it worked out to Rs. 2—8—8 per pit over the local method i.e., control. The profit due to the use of artificials alone was Rs. 1—8—2 in the bed system of irrigation and Rs. 0—6—0 in the pit system per pit. The cost of manuring worked out to Rs 0—9—0 per pit and additional irrigation charges at Rs. 1—14—10 per pit.

From the results obtained last season—January to April it was observed that the increased money yield per pit was not very high. It was thought that the quantity of manure applied per pit viz., 3½ lbs. of mixture might not be enough and so this season the experiment was continued in the same garden in the same manner but with a slight increase in the dose of manures as follows:—

Dose:—

Sulphate of Ammonia	...	@ ¼ lb.	Total of 5¾ lb. per pit or vine.
Sulphate of Potash	...	@ ½ lb.	
Muriate of Potash	...	@ ½ lb.	
Bonemeal ...	...	@ 1½ lb.	
Groundnut cake ...	...	@ 3 lb.	

The manure mixture was applied in July after pruning, trials being conducted in the same manner as in January—April season and the results at harvest in September were recorded and tabulated in the statement annexed Irrigations to the bed irrigated vines were given every fourth day instead of every day as in the previous season. This reduced the cost of irrigation considerably, thereby increasing the pecuniary returns. It is seen that the bed irrigation method has resulted in an extra profit of Rs. 4—9—6 per pit over the local method, and the application of the artificials in the same system of irrigation gave Re. 0-10-2 per pit and in pit system of irrigation only Re. 0-1-1 per pit. The difference between the bed system of irrigation plus artificials and pit system plus artificials was Rs. 5—2—7 extra profit per pit.

This season the cost of manure mixture worked out to Re. 0-11-3 per pit and there was no extra expenditure in the cost of irrigation between the bed system and pit system as in the bed system, irrigation was given once in four days whereas in pit system it was daily. The time taken for irrigation in bed system was two hours and it works out to half an hour a day which is the same for pit system per day. Hence there has been no difference in the cost of irrigation.

Observations were also made to find out the difference in weight of bunches between the bed irrigated and pit system of irrigated vines as also between artificials manured bunches and the ordinary no manure bunches of berries as shown in the statement C attached. In the April crop the average weight of bunches of bed irrigation was 0·43 lbs. and that of pit irrigation 0·40 lb. only, i.e., 0·03 lb. increase in weight per bunch at an average over the pit system of irrigation. In the artificials manured, the average weight of bunches of berries was 0·41 lb. as against 0·40 lb., i.e., 0·01 lb. in excess over the unmanured per bunch on an average. In the September season, again, in the bed irrigation, the average weight per bunch was 0·47 lb. as against 0·26 lb. in the pit irrigation, viz., 0·21 lb. in excess whereas the difference between the artificials manured and no manure bunches was 0·15 lb. per bunch. There has not been much difference between the two plots—bed irrigation plus artificials and bed irrigation alone, but a small difference was found between manured and unmanured in pit system, viz., 0·01 lb. per bunch in April season and 0·05 lb per bunch in September season. The increased yield therefore is largely due to the increase in the number of bunches. The dose of artificial mixtures

is still experimental but the system of watering in beds instead of in pits has been found to be very profitable and the surrounding ryots are much impressed. Already a few owners of gardens have copied the changed methods of irrigation and are interested in manures.

Acknowledgments. My thanks are due to the Dy. Director of Agriculture, VIII circle for suggesting the lines on which the work was started viz., initial examination of the root system, wider distribution of irrigation water and the manure mixtures. Thanks are also due to the Asst. Director of Agriculture, Salem for help and advice during the conduct of the trials and study the economics of this crop.

Note. The garden where the experiments were conducted is about 8 years old now. It is reported that the owner has had only one good crop fetching about Rs. 70/- for the 14 pits in a year, just 3 years back, and subsequently the yields were very poor and for the last two seasons prior to our experiments, it was a complete failure. During this year the owner leased his garden for Rs. (45 plus 40) i. e., Rs. 85/- and the lessee has had a profit of about Rs. 25/- for both the seasons. Thus it will be seen that the ryot had gained considerably this year due to the improved methods introduced.

Statement A

Statement showing the results of the "Manurial trials" (artificials) on Grape Vines during the year 1932 in Krishnagiri Taluk. (Two seasons—January to April & July to September).

Crop.	Nature of trial treatment	No. of Vines or pits.	Total quantity of produce.	Total value of the produce.			Quantity of berries per acre.	Value of the produce per pit or vine.			Extra cost of Artificial manure.		Extra cost of Watering.			Extra cost of Total.			Net yield per vine.			Extra profit per vine due to application of artificial.			Remarks.
			lbs.	Rs.	A.	P.		Rs.	A.	P.	A.	P.	Rs.	A.	P.	Rs.	A.	P.	Rs.	A.	P.	Rs.	A.	P.	*Manurial Mixtures.*
First (summer crop) January to April.	A) Bed Irrigation + artificial. Manuring (broadcasted).	4	253	25	5	0	63	6	5	6	9	0	1	14	10	2	7	10	3	13	8	1	8	2	G. nut cake @ 2 lbs. Bonemeal 1 „ Amm. Sulphate ¼ „ Pot. Sulphate ¼ „ — 3½ lbs. per vine or pit.
	A) Bed Irrigation only.	4	169	16	14	0	32	4	3	6	...	...	1	14	10	1	14	10	2	4	8				
	B) Pit Irrigation + artificial manuring	3	56	5	10	0	19	1	14	0	9	0	...	...	...	0	9	0	1	5	0	0	6	0	
	B) Pit Irrigation only. (Local—Control.)	3	28	2	13	0	9⅓	0	15	0	...	...	...	...	...	...	...	...	0	15	0				* Value of grapes at Rs. 2-8-0 per maund of 25 lbs.
Second (Rainy season) crop July—September.	A) Bed Irrigation + artificial manuring.	4	362	28	15	4	90½	7	3	10	11	3	...	...	...	0	11	3	6	8	7	0	10	2	*Manure Mixtures.* G. nut cake 3 lbs. Bonemeal 1½ „ Pot. Sulphate ½ „ Amm. Sulphate ¼ „ Muriate of Potash ½ „ — 5¾ lbs. per vine or pit.
	A) Bed Irrigation only.	4	295	23	9	7	74	5	14	5	...	...	...	...	...	...	...	...	5	14	5				
	B) Pit Irrigation + artificial manuring.	3	78	6	3	10	26	2	1	3	11	3	...	...	...	0	11	3	1	6	0	0	1	1	
	B) Do. (Local Method control.	3	48	3	14	9	16	1	4	11	...	...	...	...	...	...	...	...	1	4	11				* Value of Grapes @ Rs. 2 per maund of 25 lbs.

Note: * No extra Irrigation for bed system in this season.

Statement B.

Statement showing the results of the system of watering of Grape vines during 1932 in Krishnagiri Taluk.
(Two Seasons: January to April and July to September.)

Village.	Crop.	Natural of trial (Treatment.)	No. of vines (pits)	Total yield of berries obtained lbs.	Total Value of the produce.	Quantities of berries per vine.	Value of the produce per vine.	Extra Cost of: Artificial manures.	Extra Cost of: Watering.	Extra Cost of: Total.	Net yield per vine (pit.)	Extra profit due to improvement per vine (Irrigated method.)	Remarks.
Dowlatabad.	Grape Vine (Green Variety.)	**First Crop.**											
				lbs.									
		A. Irrigated in Pits only.	3	28	2 13 0	9⅓	0 15 0	...	...	...	0 15 0		
		B. Irrigated in beds (new method.)	4	169	16 14 0	42	4 3 6	...	...	...	2 4 8	1 5 8	
		A. Irrigation in pits + artificial manures.	3	56	5 10 0	19	1 14 0	0 9 0	...	...	0 9 0		
		B. Irrigation in beds + artificial manures.	4	253	25 5 0	63	6 5 6	0 9 0	1 14 10	2 7 10	3 13 8	2 8 8	
		Second Crop.											
		A. Irrigation in pits only.	3	48	3 14 9	16	1 4 11				1 4 11		
		B. Irrigation in beds—new method.	4	295	23 9 7	74	5 14 5				5 14 5	4 9 6	
		A. Irrigation in pits + artificials.	3	78	6 3 10	26	2 1 3	0 11 3		0 11 3	1 6 0		
		B. Irrigation in beds + artificials	4	362	28 15 4	90½	7 3 10	0 11 3		0 11 3	6 8 7	5 2 7	

The small difference obtained in January—April crop was largely due to the fact that the beds were irrigated daily and consequently irrigation charges were comparatively high. In the July—September season the watering of beds was done once in 4 days and the cost of watering is similar to that for pit system.

Value of Grapes @ 2-8-0 per maund of 25 lbs.

Manure Dose.

G. nut cake 2 lbs. } 3½ lbs. per vine or pit.
Bonemeal 1 lb. }
Amm.Sulphate ¼" }
Pot. Sulphate ¼" }

Irrigation given daily to all alike 37 irrigations.

Change of Dose.

Rainy Crop value of grapes at Rs. 2 per maund.

Dose.

G nut cake 3 lbs. } 5¾ lbs. per vine or pits.
Bonemeal 1½ ,, }
Amm.Sulphate 1¼ ,, }
Pot. Sulphate ½ ,, }
Muriate of Potash. ½ ,, }

Irrigation once in 4 days for beds and daily for pit 21 irrigations.

Statement C.

Statement showing the difference in weight of bunches in the grape-vine, manurial and irrigation trials conducted in Krishnagiri Taluk during 1932.

Village	Crop	Nature of trial (treatment)	No. of vines (pits) experimented	1932 April or Summer Crop January to April					1932 September Crop or rainy season crop July to September					Remarks.
				Total yield of berries		Average weight of a bunch	Difference in weight of a bunch between pit irrigation and bed irrigation.	Difference in weight of a bunch between manured and no manure	Total yield of berries		Average weight of a bunch	Difference in weight of a bunch between pit irrigation and bed irrigation.	Difference in weight of a bunch between manured and no manure vines	
				No. of bunches.	Weight.				No. of bunches.	Weight.				
					lb.	lb.	lb.	lb.		lb.	lb.	lb.	lb.	
Dowlatabad	Grape Vine (Green Variety)	A. Irrigation in Pits	3	69	28	0·40	0·03	A & C 0·01	182	48	0·26	0·21	A & C 0·05	
		B. Irrigation in beds	4	390	169	0·43			622	295	0·47			
		C. Artificials in pits + irrigation also in pits	3	136	56	0·41	0·02	B & D Nil.	249	78	0·31	0·15	B & D 0·01	
		D. Bed irrigation + artificials applied all over the area and dug in	4	585	253	0·43			796	362	0·46			

EXTRACT

THE AIMS OF A DEPARTMENT OF AGRICULTURE AND WHAT IT EXPECTS IN RETURN FROM THE FARMERS.

(The following are extracts from an address delivered by Dr. Dudley Moulton, the Director of Agriculture, California, U.S.A. to a convention of state farmers.)

The State Department of Agriculture is being conducted as a service department. Its sole reason for existence is to render you a necessary service in a manner that will give you the satisfaction of knowing your money is being well expended.

We are exerting every effort to avoid duplication or overlapping in the work of any other local, State or Federal agency. We are endeavouring to co-operate with every agency, so that the fullest use of their facilities may be made available to the farmers of the State. We believe that the department must be conducted on a business basis and that every man in our employ shall constitute a necessary and important link in our programme of welfare for the farmer. We do not expect to keep in the department's service any one who is not imbued with an appreciation of the opportunity to render a loyal service to the agricultural industry and who will not devote his ability to the fullest extent to the work in hand. A man who cannot grow and progress in his work and become increasingly useful to the State has no place in our organization. Conversely, every man who appreciates the importance of his work, and bends his entire energy and ability to the end that he can do his work better and better, will be given every encouragement and the assurance that his position is secure.

Protection of our agricultural industries from pests and diseases which have not yet crossed our borders, shall be our constant endeavor, and we shall wage increasing war on those which are always at work threatening our crops. We are guarding our live stock against outside disease just as we are protecting our growing crops. Quarantine inspections are being made carefully at all ports of entry. Our Inspectors are being given additional training and schooling in their duties.

Standardization of our fruits and vegetables must be so soundly applied that out-of-State and foreign buyers will appreciate its value, with resultant higher prices to the growers. Likewise shipping point inspection must be improved so that a grower, having been furnished with a certificate, will as a consequence find a more receptive market for his products. We must exhaust every means at our command to educate and inform the buyers in our larger markets of the meaning and value of shipping point certificates.

The economic loss to the growers through the uncontrolled spread of weeds is recognized. The prevention of this loss through control

work will be expanded and it is possible to do this in a much more effective way if done properly at the right time.

Nursery-men are important factors in the maintenance and improvement of our horticultural industries. The demand from growers for certified seedlings and certified bud wood will be met. Nurserymen are being helped with their peculiar pest control problems. Mistakes made in the past through the distribution of varieties and root stock, ill-adapted to certain soils, can be corrected in a large measure through the operation of our nursery service.

Certain desirable changes are being recommended in our crop reporting service. This work is carried on in co-operation with the other departments of Agriculture. The work was instituted primarily for the benefit of the grower and, of course, must continue to be of benefit to him. Accuracy in this information is fundamental, but comments having a bearish effect on the market have no place in these daily reports.

Legislatures have placed in our hands the licensing of many agencies engaged in the manufacture and handling of agricultural products and products used by the farmer. Holders of these licenses must conform to the provisions of their respective laws if they wish to continue in business. It may be said that only a very small percentage of the licensees ever give us cause to invoke the laws against them. Our Market Enforcement Division is so organized that it is prepared to receive complaints from growers, from produce dealers, to investigate them promptly and prosecute to the limit when necessary. Our enforcement workers will devote their best efforts to recovering for the small growers, as well as the large ones, and no charge is made for this service. Probably I cannot better conclude this brief survey of the activities of the department than by quoting directly from the code of our State, the purposes of the State Market Commission Act. Regardless of changes made from time to time in the market code, these purposes stand as guide-posts for action, and this department must give due heed to them, assuming complete responsibility for making them operative, if our duties are properly performed under our oath of office. So, may I read to you these purposes as follows:

"First—To act as adviser for producers and distributors when requested, assisting them in economical and efficient distribution of any such products at fair prices.

Second—To gather and disseminate impartial information concerning supply, demand, prevailing prices and commercial movements, including common and cold storage of any such products.

Third—To promote, assist and encourage the organization and operation of cooperative and other associations and organizations, for improving the relations and services among producers, distributors and consumers of any such products, and to protect and conserve the interests of the producers and consignors of such products.

Fourth—To foster and encourage cooperation between producers and distributors of any such products, in the interest of the general public.

Fifth—To foster and encourage the standardizing, grading, inspection, labelling, handling, storage, and sale of any such products.

Sixth—To act as a mediator or arbitrator, when invited by both parties, in any controversy or issue that may arise between producers and distributors of any such products.

Seventh—To certify for the protection of owners, buyers or creditors, when so requested, warehouse receipts for any such products, verifying quantities and qualities thereof, and to charge for such service fees sufficient to make the service at least self-supporting.

Eighth—To issue labels bearing the seal of the State Market Commission on request of the producer, packer, canner or distributor, for any such products, for which State labels have not otherwise been authorised by law, under such rules and regulations as the director may deem necessary and to charge for such labels such fees as in the judgment of the State Market Director may be proper.

Ninth—To act on behalf of the consumers of any such products in conserving and protecting their interests in every practicable way.

Tenth—To improve, broaden and extend in every practicable way, the distribution and sale of any such California products throughout the markets of the world.

Eleventh—To promote in the interest of the producer, the distributor and consumer, economical and efficient distribution and marketing of all or any agricultural, dairy and farm products produced, grown, raised, manufactured or processed within our State.

We take up each problem as it comes to us and endeavour to solve it in a way that will be fair to all, and of benefit to the farmers and growers of this State.

Are you prepared to play your part in this modern phase of agricultural development? The State, as represented through the Department of Agriculture, if it is to render effective service to the people of California, must develop policies progressive in their nature and which conform to your actual needs and desires.

It is your money which supports the Department of Agriculture. The department's principal function is to serve you, the producers, but there is scarcely an activity or function coming under our jurisdiction that does not directly concern every citizen of the State. We reach into every home and perform certain necessary measures for the health and protection of every man, woman and child in the State. We are, consequently, under the critical scrutiny of a taxpaying citizenry which at the present time is very definitely convinced that the existing system of taxation is a burden no longer endurable unless necessary adjustments are made.

Thus, very briefly, I have tried to present to you the activities of this department and our relations to all of our people. Remembering that its actitivies affect all, likewise recalling to yourself that the primary purposes of the department's functions are designed to support your great industry, it must be clear to you that you have a very definite responsibility toward this part of your State government.

Our first concern must be the development of a policy dealing primarily with the higher interests of the producer himself. I believe all feel that the development of such a policy is in no sense contrary nor opposed to the interests of any other section of our population.

Such a broad policy must involve a deep concern for the welfare of the weak as well as the strong and should be based upon practices seeking to prevent the liquidation of the individual. The right to produce is God-given, and one for which we must assume grave responsibility if we seek to impose artificial limitations in the face of a world which, even at the times of so called normal prosperity, daily witnesses the underfeeding of millions of its inhabitants.

We want our big general agricultural policy so designed that everything within the power of the State will be done to avoid the bankruptcy procedure now so generally in use that it constitutes one of the most fearful problems faced by this gathering today. The issue itself is simple—shall we adopt the bankruptcy method which will thereby eliminate many of our farmers, or shall we do something calculated to make a reasonable adjustment between supply and demand now, and protect the unfortunate. Long ago we abandoned the laws of the jungle in our social and business intercourse. Most of our differences are settled by agreement. Is it not reasonable to assume that we may be able, through a measure of agreement of all factors concerned with both the production and the marketing of agricultural commodities, to protect the unfortunate or the border-line individual so that he may have the right to survive? His removal from the farm simply adds to our unemployment problem.

Agriculture is vested in the producer himself, in the land which he has acquired through his capital and his labor, and in the improvement which he has placed thereon. The allied industries, with investments in packing houses and canneries, are dependent on your prosperity for their existence. What, then, is the proper method of recognizing the primary right of the producer to control his crops, and to dictate as to how they shall be distributed to the consumer? Frankly, we can see no method other than through organised effort. Organisation without possession of the facts on which its activities must be based is just as futile as the operations of a corporation without working capital.

Today you are face to face with the real problems and I am convinced that you are determined to grapple with them. Without further argument we will take it for granted that you are willing to assume the responsibility for clearing up your own difficulties. Are you, then, going to exercise this responsibility which implies control of the commodities which you produce, through organization from the grass roots up, or are you going to have it imposed upon you from

above? The era of individualism is at an end so there are only two alternatives; one, organization by yourself; the other, organization imposed upon you.

Undoubtedly, yon approve of a grass-root method of grappling with your problems. Once you have chosen your battleground you must select your weapons with care. Nothing in your arsenal will be more important than the adequate provision of basic information, so we come back to that oldest and soundest method of solving any problem and making the solution permanent, and that is education based on facts.

The department has not waited on this convention to put the machinery into motion toward carrying out measures designed to be of aid to agriculture. It is enjoying the confidence and co-operation of the interests which its operations affect, both directly and indirectly, and in generous measure.

We have sought and received the utmost co-operation on the part of the dairy industry in our efforts to eradicate tuberculosis among cattle. We have consulted the industries affected in all other regulatory work and have found them more than willing to assist. This cooperation has enhanced the efficiency of the department and we believe that the industries themselves have a full understanding and appreciation of the necessity for the regulatory functions, and that they are no longer inclined to regard the department merely as a police institution.

The activities just mentioned are concerned with very tangible aspects of agriculture. When we come to the big issue of better marketing there are so many factors involved that our very first duty is to get basic information. This we have endeavored to do in the various commodity price ware, in which tne intervention of the department has been sought. This task of getting at the facts is just about the biggest job faced by the department. Now comes the time when it is necessary to place all available data in the hands of the producer. The department, believing that the producer must help to solve his own problems, looks forward to the growth of discussion marketing institutes. These will provide community forums where the grower and farmer will meet and discuss various problems affecting their industry. Your own convention here today is primarily an educational venture. It is a forum from which you may discuss with the utmost freedom your beliefs, your theories, your plans and your hopes. From such forums as your convention and the institutes, and other gatherings of farmers, this department hopes to get that impression of the wishes and desires of agriculture which should guide our activities.

Notes and Comments.

New Year Greetings. In presenting the closing number of the current volume of the Journal, we venture to offer our grateful thanks to our numerous clients for their patronage, help and encouragement during the past year and to extend our hearty greetings and good wishes for the New Year. With the long help and co-operation of our contributors, patrons, advertisers, subscribers and other readers, the journal is completing its 21st year of life and has entered on a period of adolescence. The past year like its predecessor was one in which our country like the rest of the world was submerged in a wave of economic depression and like many periodicals in our line we had to pass through a strenuous period. It was, however, gratifying that our clients as a whole treated us with the utmost consideration and but for their co-operation we would easily have lost ourselves in the wave of depression. We, therefore trust that our numerous clients will continue to render us the same aid and encouragement as in the previous years and continue to extend to us that substantial share of support to enable us to maintain the cherished traditions and perform the useful function the journal has striven to fulfill.

An Agricultural School for Coimbatore. Those interested in agricultural matters and especially in agricultural education will be pleased to hear that the Coimbatore District Board has recently made a contribution of Rs. 25,000/- to the Government for opening an Agricultural school in the district on the lines to be suggested by the Director of Agriculture. They have however added a proviso to the effect that the students for the new institution are taken primarily from the Coimbatore District.

The Indian Science Congress. The twentieth session of the Indian Science Congress is to be held at Patna from the 2nd to the 7th January 1933 under the general presidency of Dr. L. L. Fermoor O. B. E., D. Sc , Director of Geological Survey of India. The different sectional presidents for the year are as below :—

Agriculture.	M. Afzal Hussain Esq., M. A. (Cantab) M Sc. (Punjab).
Zoology.	R. Gopala Ayyar Esq.. M. A. M. Sc., (Madras).
Botany.	Dr. S. L. Ghose M. Sc., Ph. D., (Lahore).
Chemistry.	Dr. P. Neogi, M. A., Ph. D., (Calcutta)
Mathematics and Physics.	Dr. A. L. Narayana, M. A., D. Sc., (Kodaikanal).
Medical and Veterinary Research.	Lt. Col. A. D. Stewart M.B., D.P.H. etc. (Calcutta).

Intending visitors are directed to apply for any information to the local secretaries Dr. K. S. Caldwell, M. A., Ph. D., and Mr. Kamta Prasad, B. A. both of the Science College, Patna.

The Board of Agriculture and Animal Husbandry. It is understood that this Board is to hold its next meeting during the second half of February in New Delhi. We are also glad to hear that the Inter University Board of India has elected Dr. T. V. Ramakrishna Ayyar, our Entomologist and Dr. B. Sundararaj, Director of Fisheries as their representatives for the Animal Husbandry wing of the Board of Agriculture a meeting of which is notified to take place in Delhi from the 20th to 23rd February 1933. The subjects put down in the privisional agenda for this meeting include among others the following:-

1. The organization necessary for the future development of Animal Husbandry in India.
2. Improvement and unification of the existing standards of veterinary education, particularly in regard to Animal Husbandry subjects.
3. The better utilization of forest areas for grazing.
4. The scientific development of Animal Industry, including the commercial aspect of dairy and other animal products.
5. The organisation at present in existence and that which may be found necessary for (1) a systematic study of the arthropod pests of cattle and other useful animals, (2) and investigation of the many diseases caused by them, and (3) the practical measures of control for the same."

The late Mr. M. K. Nambiar. We regret very much to have to record the most unexpected and sudden demise of Mr. M. Kunhambu Nambiar, L. Ag., Assistant Director of Agriculture, Madura recently, as a result of a severe type of small-pox. In his death the department has lost a very able and exceedingly good officer. His suave manners and thoroughly unostentatious ways have always endeared him to all who came in contact with him. He belonged to a very respectable Nair family in South Kanara and was one of the first set of Coimbatore Diplomates having joined the College when it started in 1908. After serving as Farm Manager in several places and having been in charge of the Taliparamba Agricultural School he was raised to a gazetted rank in 1928 and death has snatched him away all too suddenly during the prime of his life and activities. We offer our most sincere condolences to the members of his bereaved family.

Gleanings.

Carbohydrates in relation to disease. The abundance of cheap sugar, is not only an embarassment to the sugar industry, but, according to Dr. J. H. P. Paton, also brings risks in connection with disease (*Edin. Med. Jour.* 39. No. 9. p. 556).

Dr. Paton estimates that the average consumption of sugar is now in the neighbourhood of 100 lb. per head per annum. Sugar, as we use it, is not a natural food and is devoid of all accessory food substances. Excessive consumption of sugar teuds to upset digestion, is a factor in the production of rickets and dental decay, and leads to retention of water in the body, with an increased tendency to catarrhal affections. It is probably responsible for the increasing frequency of acidosis in the modern child, and it throws additional work on the pancreas which may result in degeneration of this organ and diabetes. Experimentally, an abundant supply of glucose promotes the development of cancer in mice and carbohydrate excess may therefore be one of the factors causing the increased prevalence of cancer.—*Nature*, Octocer 1, 1932.

Control of Mosquitoes. To control this pest stagnant water in the vicinity of the house should be removed and if possible windows which are open at night, especially if there is a light inside, should be gauzed. Some of these insects, however, manage to gain access to bed rooms and cause loss of sleep. Against such citronella oil applied to the hands and forehead is recommended, but as the smell is strong and sweet, it may cause headaches. Perhaps the best and most satisfactory method of keeping mosquitoes away from beds is the following:—Procure an atomizer of which there are many in the market, and one that is well looked after will last indefinitely. Prepare your liquid spray by obtaining 1 lb. of fresh pyrethrum powder and adding it to one gallon of ordinary paraffin oil. Shake it thoroughly and often, for a day and let it settle over-night by which time all the poison should be dissolved in the paraffin. Filter off the paraffin through a fine linen hand-kerchief and add 1½ oz. of citronella oil or oil of winter green, to destroy the smell of the paraffin. Do not spray this near a naked flame, as the vapour is inflammable. A couple of shots on the head of the bed, and a couple on the coverlet, should afford one a peaceful night. Where mosquitoes are very troublesome, more should be sprayed about the room. This preparation will not stain linen or wall paper—*Farming in South Africa*, October 1932.

Effect of Feeding Palm kernel Cake on Fat content of milk. *C. Kronacker, J. Kliesch and E. Leberl.* (*Deutsch. Landwirtsch. Tierzucht* (1932) 36, 221–223). It has previously been shown that the feeding of not less than 2 kgm. (1 kg. = 2·2 lb.) palm kernal cake per head per day raised the fat content of milk by 0·34 per cent. In the present experiment of 7 cows, from 2·1 to 3·9 kgm. palm kernel cake per day was added to the other concentrates in proportion to milk yield. All animals showed an increase in fat content of milk, varying from 0·2 to 0·7 per cent with an average of 0·4 percent. The amount of increase was not determined by the level of feeding palm kernel cake, but by the individuality of the animal, provided that the minimum quantity (about 2 Kg.) was fed. Milk yie d was not affected—*Scottish Journal of Agri.* 15. (1932) p. 464

No loss of Moisture by capillarity in our Dry Farming areas. For many years it has been the opinion of the agricultural scientists and experts that a loose dry soil mulch was effective in preventing loss of moisture from the soil, by checking the rise of the soil moisture to the surface. It was held that water was capable of rising in the soil by capillary action and thus reaching the surface, where it was evaporated unless prevented by means of a mulch, but research in recent years tends to show that the upward capillary movement of soil moisture is effective only over short distances and it is only when the ground water level is within about 6 feet of the soil surface that moisture can rise to the surface. Under dry farming conditions there is consequently no loss by capillarity and therefore a soil mulch in itself is of no value in checking the loss of soil moisture. This fact, however, does not materially reduce the importance of the cultivation of the fallow, as it prevents loss of moisture through weeds, which are

robbers of soil moisture. Furthermore, the maintenance of a loose, coarse, granular mulch will allow rains which fall during the spring and summer to sink into the soil readily instead of running off or being held near the surface to be rapidly evaporated.

There are other benefits to be derived from the cultivation of the fallow apart from conservation of moisture. For instance, the aeration of the soil promotes the development of soil bacteria, which results in increased production of nitrates, and moreover, one of the chief advantages of a cultivated fallow is the preparation of a good seed bed, which ensures ready germination and vigorous early growth of the crop. As a result of the compacting of the seed bed, the amount of moisture per unit volume of soil is increased with the result that the young roots of the crop can obtain the moisture more easily—*Agri. Gaz, of New South Wales*, October 1932.

Improved Phosphate Fertiliser. A new method for the preparation of phosphate fertiliser in which raw calcium phosphate fertiliser is completely converted into soluble phosphate has been introduced in France. In the process lead chloride is used as an intermediary reagent in a hydrochloric acid solution which, with calcium phosphate gives lead chloro-phosphate and calcium chloride. The lead chloro-phosphate treated with nitric acid gives lead nitrate and the phosphoric acid remains in solution in the nitric acid medium. The lead nitrate is removed by treating with potassium chloride and a mixture of potassium nitrate and lead chloride is thus obtained. The latter is used again in the cycle of operations and at the end a mixture containing nitric acid and phosphoric acid remains. This mixture when saturated with ammonia gives a soluble fertiliser in which the whole of the phosphoric acid is in a soluble state. It is reported that the method has already been put into operation on a semi-industrial basis. —*Scientific American*, November 1932.

Unbreakable glass. A new form of plate glass which is said to be practically unbreakable has been put on the market in Germany. This new product differs from the well known shatter proof glass used in modern automobiles in that it is not laminated but is a solid sheet of glass. The makers claim that it is more resistant to impact, pressure and vibration than lassinated glass. An 18 oz. steel ball dropped on this glass from a height of about 8 feet will rebound without a mark. The elasticity of the glass is so great that a braced sheet will bend under the weight of two men, but after removal of the weight will return to its original position. This glass which is called "Sekurit" has half the strength of steel and twice the elasticity. It is not sensitive to temperature or atmospheric influences since it has no lassination, the danger of bubble formation or darkening is eliminated. Of course this glass is wholly transparent and does not change with age. Of particular interest is the fact that, when fractured by a sufficiently strong blow, it does not shatter into long splinters, but crumbles up into granular pieces which have no sharp edges.—*Scientific American*, November 1932.

Non-lumping sugar good for diet. The housewife's trouble with lumpy sugar may soon be a thing of the past. Science has found a substance which, added in the manufacture of sugar prevents lumping and caking. This same substance, calcium phosphate, has been shown to have valuable health properties and provides the elements essential for the development of bones and teeth. "The addition of 1 per cent of tricalcium phosphate" H. V. Moss, Chief Chemist of the Provident Chemical Works of St. Louis declared in a recent report, "completely prevented the formation of lumps in XXXX powdered sugar on standing for 53 days under the normal summer conditions prevailing in St. Louis. Calcium phosphate seems especially suitable for use as a sugar conditioner because recent biochemical research has shown that it is a valuable addition to the diet. The diet of many Americans especially those who eat large quantities of wheat, white

flour and sugar may be deficient in calcium and phosphorus which are needed for building bones, keeping the teeth from decay and preventing the premature appearance of old age. Both white flour and sugar are largely deprived of the original contents of these elements during the refining processes and it seems to be a step in the right direction to restore them to the popular foods.—*Scientific American*, November 1932.

Must We Eat Copper. The old query "Have you had your iron today?", may soon have to give way to a revision "Have you had your copper?". At the recent meeting of the American Chemical Society, two independent researches added new evidence for the importance of copper in normal blood formation. The two research teams were both from the University of Colarado. In the first series of experiments anaemic rats were given copper in their diets with no change in the amount of iron. Their red cells increased approximately two-fifths in number in five weeks, while the haemoglobin or blood iron showed only a slight increase. In the second series of experiments, rats became anaemic and died in a short time on a diet of milk and iron alone, but grew normally and lived many months when copper was added to the ration. At the end of from 12 to 22 months, they were entirely normal in both blood and body tissues.—*Scientific American* (Science Service) November 1932.

ABSTRACTS

Studies on the Nutritive value of Milk.—I. The deficiencies of an exclusive milk diet and how to overcome them. W. E. Krauss (*Ohio Agrl. Expt. Station Bulletin No.* 477). The author's experiments with weanling rats (24 to 28 days old) showed that an exclusive milk diet (of milk obtained from three groups of Holstein cows on widely different rations) was far from being "perfect food", in as much as it caused severe nutritional anaemia, due to deficiency in iron and copper, both of which are essential for maintaining the haemoglobin content of the blood at a normal level. The iron and copper content of milk cannot be increased by feeding increased quantities of iron and copper salts to the cow. The bearing of such iron and copper deficiency of cow's milk is discussed in relation to anaemia caused in babies fed exclusively on milk. Analyses of infant livers show that the child is born with a supply of iron and copper sufficient to meet its needs for some time; however, it will be safer to add to the infant's diet some food like strained spinach, rich in the deficient elements, as soon as possible. The part played by various foods in increasing the haemoglobin content of milk is pointed out; dextri-maltose, corn-syrup, vitavose or Mellin's food, when fed at a 7% level with milk gave haemoglobin values slightly below optimum. Orange juice and tomato juice had no significant effect on haemoglobin. With infants, wheat embryo extract proved to be very effective. As soon as the human diet becomes varied, no further concern as to copper and iron deficiencies need be felt, provided a certain amount of care is exercised in the selection of foods. Apricots, peaches, prunes, raisins, grapes, apples, spinach and cabbage are effective in haemoglobin regeneration, while green vegetables, milk, cream, butter, onions, orange juice, egg yolk etc., though rich in vitamins, have poor haemoglobin regenerative power. Various types of anaemia occur in horses, cattle, sheep and swine due to deficiency of iron and copper. Cane molasses were found to possess great antianaemic potency, while beet molasses were practically inert. No reproduction occurred in rats fed on an exclusive whole-milk diet. The addition of copper; iron and copper; iron, copper and yeast; iron copper and wheat germ oil; yeast alone; or cane molasses, allowed reproduction, but lactation was poor.

(C. N.)

Effect of Mosaic on Tonnage and the Juice of Sugar-cane in Pusa. Part II.—Mc. Rae, W. *Indian Jour. Agri. Sci.*, 1932, vol. 2, part IV, pp. 378—384). In continuation of last year's experiments (*Indian Jour Agri. Sci*, 1931, vol. I, part V, pp. 527—533), the author has repeated the experiments on a statistical basis using 16 pairs of plots each 5 x 50 yards. After removing canes to eliminate edge effect, mosaic-infected Co. 213 cane was found to give 11 % less of germination after 7 weeks, and 14·8 % less yield of stripped cane, 3·9 % less yield of juice, slightly lower values of brix and sucrose, as compared with mosaic-free cane. The differences in weight of cane, weight of juice, brix and sucrose were all statistically significant, but not those of percentage of juice to cane, glucose and purity. The loss due to mosaic amounted to about 15 % cane to the grower and 4 % of sucrose to the manufacturer. The average infection in Bihar was only about 0·2% on 8 estates scattered fairly regularly along a line of 120 miles. This is a low level of infection, but the experiments above described show how great the loss may become if mosaic disease were to spread to any great extent in the sugar-cane areas. (C. N.)

Studies in Indian Tobaccos. VII. The types of Nicotiana tabacum, L.—F. J. F. Shaw and Kashi Ram (*Indian Jour. Agr. Sci.*, 1932, Vol. 2, part 4, pp. 345–357). The authors stress the importance of a systematic study of the types of tobacco now grown in India. Since its first introduction into India about 1605, the cultivation of tobacco has increased to such an extent that India is now the second largest tobacco growing country in the world, producing about 1000 million pounds, of which 970 million pounds are used within the country itself. Madras and Bengal take the lead with about 250,000 acres each, followed by Hyderabad, Bombay, Burma and Bihar with about 100,000 acres each. In India, two species of tobacco are grown, viz. *Nicotiana rustica* L. and *Nicotiana tabacum*, L., of which the former is widely cultivated in Bengal and up-country almost entirely for smoking in the country pipe (*Hookah*), and the latter is grown practically all over India and supplies the major portion of the tobacco of commerce. In a previous publication (*Memoirs Dept. Agr. India, Botan. Ser.* Vol. II', 1930), Howard and Howard have described fifty-one different types of *Nicotiana tabacum* L. In the present paper, the authors describe another 18 types numbered 52 to 69, which have been isolated recently from a collection of mixed samples of seeds obtained in 1925 from the leading tobacco growing centres of the country. Two types numbered Pusa 60 and 61 have been isolated from seed obtained from Coimbatore. (C. N.)

Oil Seeds and Vegetable Oils. *Report published by the Empire Marketing Board*, London, 1932, price 6 d. net). This publication aims at presenting the statistics of production and trade within the British Empire and outside, relating to the important oil seeds and vegetable oils, like copra, groundnut, cotton-seed, linseed, olive oil, soya beans, sesame seed, rape-seed, palm-kernels, palm oil etc.—which statistics might prove useful in these days of preferential trade within the empire. The pamphlet opens with a general comparison of the total world-production in the different oil seeds, with the quantities produced within the Empire, and later proceeds to study in detail the world and empire trade in each particular oil seed. In volume of total world production, soya beans and cotton seed top the list with 15 and 12 million tons respectively, with groundnut (6 million), linseed (3·6 million), copra (2·3 million) following behind. In point of oil equivalent, soya-beans, cotton seed and ground nut share an equal place (2 million tons), with copra (1·5 million) and linseed (1·2 million) following close behind. Over one half the world's production of palm kernels, palm oil, sesame seed, castor seed and rape seed lies within the Empire, which also accounts for a considerable share of the world's output of copra (60%) and groundnut (43%). But

barely one-fifth of the world's cotton seed, only one tenth of its linseed, a negligible proportion of its olive oil and virtually none of its soya beans, sunflower seed, hemp seed and tung oil are of empire origin. The international trade in oil seeds is mainly restricted to palm kernels, linseed, castor seed and copra; the other seeds are mostly retained by the producing countries for home consumption. Thus the U.S.A., India and China export only a very small proportion of their cotton seed; India and China export only 23% and 6% respectively of their groundnut, China exports only about 20% of her soya beans, etc. While the Empire countries are the largest producers of seeds, they are also the chief exporters, the importing countries being mainly on the Continent of Europe, e. g. Germany, France, Italy and Holland. The U. S. A. and Japan also import some quantities. The United Kingdom imports only a small proportion of the world's groundnut, copra, rape-seed and sesame seed, and a moderate proportion of palm kernels and palm oil—but she is the chief importer of cotton seed. Of the world's total supply of cotton seed, the United Kingdom takes 81% and Japan 11%; in groundnut, France takes 38% and Germany 34%; in copra the U. S. A. takes 24%, Germany 20% and France 18%; in sesame seed Japan takes 18%, Germany 14% and Italy 13%. Taking all oils and oil seeds together, and basing a comparison upon the oil equivalent of the seeds, Germany is easily the largest importer, France the second largest and the United Kingdom third. (C. N.)

Some aspects of the growth of Rice in the Heavy Black Soils of the Central Provinces.—D. V. Bal and R. N. Misra (*Agri. and Livestock in India*, vol. 2, part 4, pp. 404–409). The object of the preliminary investigations presented in the present paper, was to examine the causes for the poor yield obtained during the first 4 or 5 years, when heavy soils, ordinarily growing wheat in the Central Provinces, are converted into rice *bandhis* (embanked fields for rice cultivation). The contributing factors taken up for experimental verification were (1) the heavy character of the wheat soils; (2) the unsuitability of the practice of continuous submergence of the heavy soil under water, for rice; (3) the high pH value of wheat soils, and (4) the possibility of a difference between the biological flora of the heavy wheat soils and the established heavy or light rice soils. In regard to factors 1 and 2, the authors found that the change brought about in the texture of the heavy soil by additions of varying quantities of sand, did not appreciably help the growth of rice in pot culture experiments. It was, however, noted that with heavy wheat soils, the growth of rice was considerably improved if the water was not allowed to continually stand in the pots. The authors have not examined the fourth factor, but in regard to the third, viz. acidity, they find that heavy wheat soils contain a good proportion of lime and show a higher pH value (7·5 to 8·0), as compared to similar heavy soils which have been established for some years under rice (pH 6·6 to 7·5). Experiments with sand cultures showed that the rice plant preferred a slightly acid (pH 6·5) or neutral medium to an alkaline one. With a view to reduce the pH of the heavy soils, field experiments were carried out to test the effect of additions of sulphur along with green manure. The results indicate that in the case of heavy soils, with a basal dressing of green manure, sulphur gives increased out-turn; but annual applications of super-phosphate either individually or in combination with sulphur give decidedly better results. (C. N.)

Some Digestibility Trials on Indian Feeding Stuffs. Part VIII. Some Punjab Hays and Wheat Bhusa. P. E. Lander and L. C. Dharmani. (*The Indian Journal of Veter. Science*, 1932, vol. 2, part 2, pp. 141–149). In the previous papers of this series (*Mem. Dept. Agr. India, Chem. Ser.* IX, 7 and X, 5), the authors have shown that the chemical composition and digestibility of grass hays gathered from the different parts of the Punjab differ widely from one another, and that

some of them constitute maintenance rations for animals at rest, while others do not. In the present communication, the authors report the result of experiments carried out in 1929 with six Montgomery heifers of 2 to 3 years of age and body weight from 360 to 420 lbs., in order to test the nutritive values of six grass hays supplied by the Military Grass Farms at Jhelum, Ferozpur, Kasauli, Dalhousi and Multan (2 grasses) and their comparison with wheat *bhusa* as a cattle feed. The Ferozpur hay, which contained 8·5% protein, 10·97% ash, 0·99% fat, 31·25% fibre and 43·18% nitrogen free extract, proved to be a good maintenance ration, giving a good positive daily nitrogen balance. Jhelum hay (4·63% protein) was the next best, being just a maintenance ration; other hays like Dalhousi (3·19% protein) and Kasauli (3·75% protein) required a supplement of bran (1 to 1·5 lbs. per day) for maintenance standard. Wheat bhusa is generally very poor in protein (2·19%) and requires a supplement of 1 to 1·5 lbs. of added bran, to provide a maintenance ration for heifers of the weight and description used in the trials. (C. N.)

Factors affecting the accumulation of Nitrate Nitrogen in high Plain Soils.—H. H. Finnell (*Oklahama Agrl. Exp. Sta. Bull.* No. 203, pp. 1–47, 1932). The author points out that the beneficial effects produced by suitable cultural practices and crop sequence and fallow methods on the quality and quantity of crops produced on heavy soils under semi-arid conditions, is principally due to the controlling influence exerted by these practices on the accumulation of nitrate nitrogen in the soil and their disposition relative to soil moisture and cropping. A biometric analysis of those factors which influence nitrate accumulation in the heavy silt-loam soil at Goodwill Oklahama, during 1924-30, showed the following relations to top-soil nitrate accumulations observed at the end of the year:—(1) The rest period or the interval of time between the last previous harvest and nitrate sampling was the most important factor favouring nitrate accumulation. (2) The distribution of effective rainfall, was second in importance, as represented by the length of time next preceding the nitrate sampling, which was required to supply an amount of effective rainfall sufficient to displace the top-soil moisture, (3) The number of excessive rains falling during the year (which roughly indicated the number of times the top soil layer was leached) was third in importance, affecting nitrate accumulation adversely (4) The amount of cultivation given during the previous year; this was measured by taking the sum of the depths of all cultivations for the calendar year, (5) Total yields removed from the plots, and the amount of raw organic matter carried over from one year to another, showed little independent effects upon nitrate accumulation under the conditions of the experiment. (6) High nitrate accumulations were associated with a high winter soil moisture. (7) The relative importance of the rest period was much emphasised by extending it from 6·5 months to 12·8, suggesting the acceleration of nitrification after a certain stage of the decay of raw organic residue had been reached. (8) The heavier system of cropping introduced in the rotation experiments resulted in shifting some of the weight of influence governing nitrate accumulations from other factors to that of yields removed, which exhibited a negative relationship. (9). The downward movement of nitrates as a result of leaching, appeared to be normally slow enough but considerable balances of nitrate nitrogen remained in the surface and sub-surface soil (10) Land producing a crop showed the highest nitrate concentration at or soon after the beginning of the growing season. Nitrate concentrations observed at various points in the lower sub-soil corresponded closely to the depths, surface water, as shown by moisture records, had penetrated during the previous period. (11) Crops known to be particularly exhaustive of soil nitrogen under semi-arid conditions, such as sorghums grown in cultivated rows, were shown to allow regular leachings to take place beyond the depth of root growth as a result of manner of incidence of the growing season upon the normal moisture distribution. (12) Extended

fallowing permitted excessive leaching; continuous wheat growing most effectively prevented leaching losses. (C. N.)

The Manuring of Vegetable Crops.—(Leaflet No 320 issued by the *Ministry of Agri. and Fisheries*, London). In the present leaflet, simple rules are given for the manuring of ordinary vegetable crops like potatoes, cabbage, peas, beans, onions, celery, carrots, parsnips, beet, lettuce, spinach, radishes etc. Stress is laid on the importance of applications of dung, pigeon and poultry manure and other kinds of organic manures. In regard to use of artificial fertilizers, the crops are divided into four groups:—(1) crops requiring chiefly phosphates and potash, e. g. potatoes, peas and beans; (2) crops requiring chiefly nitrogen and phosphates, e. g. cabbage, cauliflower, sprouts, broccoli etc.; (3) crops requiring nitrogen and potash e. g. beet, carrot, parsnip and radish; (4) crops requiring nitrogen, potash and phosphoric acid in more or less equal proportions, e g onions, leeks, turnips, celery and fruits. (C. N.)

College News & Notes.

Students' Club. Debates. *3rd October 1932. Subject*:—"That the Religious and Social differences are no impediments to the advancement of any Nation." *Speaker*:—Dr. J. S. Patel, M.Sc., Ph.D. *Proposed by*:—Mr. G. Satyanarayana. *Opposed by*:—Mr. D. C. Hanumantha Rao. In moving the resolution of the evening Mr. G. Satyanarayana opened with a few preliminary remarks on the scope of the resolution. He cited the cases of Rome, Greece and America in support of his resolution. He stressed the importance of a lively and active sense of national responsibility and sacrifice of petty interests when the more imperative needs of national progress were involved. Mr. D. C. Hanumantha Rao in a forcible speech pointed out how countries having very little of social and religious differences had advanced. He observed how a nation with social and religious differences could be compared to a heterogenous mixture of gunpowder requiring a mere spark to set it ablaze. Though these differences may not prove real barriers against the advancement of any nation they were impediments all the same. A very interesting discussion followed wherein several students and some of the officers took part In the course of the discussion it was pointed out that differences were bound to exist and that the spirit of unity in diversity and the will to surmount the obstacle were the most potent factors that could bring about a nation's progress. Dr. J. S. Patel in his concluding remarks opined that social and religious differences were no impediments to national progress provided the will to win reigned supreme in the minds of the nation. The motion was put to vote and declared lost.

16th November 1932 Subject:— "It is desirable and profitable that officers of the Agricultural Department should after gaining experience go back to the land." *Speaker*:— Rao Bahadur T. S. Venkataraman, Imperial Sugarcane Expert. *Proposed by*:— Mr. Y. V. Narayaniah of B. Sc. III. *Opposed by*:— Mr. K. Krishnamoorthi Rao. In opening the debate Mr. Y. V. Narayaniah explained how the unemployment problem was getting serious. He suggested that if officers after some years' service in the Department gaining enough capital and experience during the period took to farming on their own it would give an opportunity for the younger generation to get a footing in life. To this effect he appealed to the house to consider the proposition in a dispassionate manner. Mr. K. Krishnamoorthi Rao in opposing the motion pointed out that if experienced poeple left the Department and took to private farming the efficiency of the Department would be endangered. He mentioned several instances where private farming had not proved lucrative. He observed that even if it was desirable the enterprise was too risky to be taken up. A very interesting discussion followed in

which several officers and students took part. Special mention should however be made of Mrs. Paul Karnakar, who in an impressive short and charming speech wondered how if people after gaining experience could not go back to the land, it would be possible for raw graduates to take it up. She assumed that if men relinquished their jobs and took to private farming their women would surely join hands with them most willingly. The speaker in his concluding remarks deplored that Agricultural service was at present looked upon as a merely bread winning service. He looked forward to the time when the missionary spirit of service for the precarious millions would reign supreme in the minds of the officers. He strongly felt that though it would not be profitable to the officers it would certainly be desirable that agricultural officers should go back to the land.

8th December 1932. Subject:—"The trend of modern civilisation is to over reach its own aims". *Speaker*:—Dr. T. V. Ramakrishna Ayyar. *Proposed by*:—Mr. V. Muthusamy Ayyar. *Opposed by*:—Dr. T. R. Seshadri. The proposer observed that modern civilisation was nothing but materialism with the spirit of inner self of man entirely forgotton. There have been several civilisations of old that have once flourished and, lost, and the last of them the Roman, had influenced the present western civilisation. When we hear about the hoary and ancient civilisation of India it must have been a glorious one. In the modern civilisation we have wars economic, political and religious. Unless the tendencies of the present civilisation to grab as much as possible for oneself at the expense of others are corrected we are sure to have a big collapse sooner or later. The present day civilisation has even affected our ways of living, rural conditions, social amenities etc. all for the worse and our society and race will surely come to ruin if the undesirable elements of the present civilisation are not brought under control. Dr. T. R. Seshadri in opposing the motion stated that the outlook of men at the present day was certainly better and the aid of science had been brought in all the activities of human life to make life more comfortable and worth living. The application of science to Agriculture has enabled more areas to be brought under cultivation and production had been considerably increased. Labour is better organised and greater attention is being paid now than before to education and sanitation of the rural and urban areas. With the achievements which science is bringing in, there is nothing to despair about our future. Several, took part in the discussion that followed chief of them being, Mr. V. Ramanathan, Rao Bahadur T. S. Venkatraman. Mr. G. N. Rangaswamy Ayyangar and students. The speaker in closing the proceedings rather thought that the present civilisation was not likely to lead to a happy future.

At a public meeting held on 30th November Dr. J. S. Patel gave an informal talk on "The Socio, Eco-Political development in the United States of America" Dr. Patel in the course of a very illuminating and interesting speech dealt first with the changes in the social life of the Americans brought about by the emigration of foreigners into the land which led to the elaboration and introduction of Migration Laws. This also brought in its train social and religious differences which gave rise to resistances against freedom of thought and individual liberty. Speaking about the colour problem he said that even though according to law all races and creeds were equal the rights of citizenship are denied to negroes and this is especially so in the south. The lecturer assigned three important reasons for the industrial prosperity of America. The large home market, protection of the various important industries, and standardisation of the products coupled with a wide publicity. With all the social and religious differences the speaker opined that America is the most prosperous country to-day because of the Americans' devotion to prosperity, energy and life. With a vote of thanks the meeting came to a close.

Weather Review (NOVEMBER—1932)

RAINFALL DATA

Division	Station	Actual for month	Departure from normal	Total since January 1st	Division	Station	Actual for month	Departure from normal	Total since January 1st
Circars	Gopalpore	14·1	+10.0	38·1	South	Negapatam	30·8	+13·0	55·3
	Berhampore *	17·9	+11·6	45·6		Aduthurai *	18·1	+8·4	44·5
	Calingapatam	11·0	+7·1	36·1		Madura	9·1	+4·2	32·4
	Vizagapatam	15·2	+11·5	34·7		Koilpatti *			
	Anakapalli *	8·5	+4·2	37·3		Pamban	12·2	+0·2	28·7
	Samalkota *	6·9	+2·9	35·0		Palamkottah	4·9	−2·5	22·4
	Cocanada	7·5	+2·0	36·5					
	Maruteru *	6·4	+2·8	39·1					
	Masulipatam	4·8	−0·9	37·5					
	Guntur *	4·4	+0·9	34·9	West Coast	Trivandrum	15·9	+9·3	90·9
Ceded Dists.	Kurnool	3·4	+2·3	22·0		Cochin	9·8	+3·2	135·4
	Nandyal *	3·6	+2·4	21·5		Pattambi *	4·6	+0·6	115·6
	Bellary	3·7	+1·5	25·5		Calicut	6·1	+0·7	159·3
	Hagari *	1·3	−0·7	22·9		Taliparamba *	10·7	+6·5	164·7
	Cuddapah	6·1	+2·5	19·4		Kasargode *	4·8	+0·4	126·7
						Nileshwar *	9·5	+6·3	175.9
Carnatic	Nellore	11·8	+0·5	28·3		Mangalore	3·7	+0·6	121·7
	Madras.	11·5	−2·7	43·5					
	Palakuppam *	16·7	+5·6	45·1					
	Cuddalore	17·9	+2·8	44·3	Mysore and Coorg	Bangalore	4·1	+1·1	42·7
	Palur *	11·7	+8·1	39·0		Chitaldrug	6·7	+4·4	37·8
						Mysore	3·6	+1·0	31·1
Central	Vellore	7·3	+0·4	28·2		Mercara	5·1	+1·8	138·2
	Salem	7·9	+4·1	47·0					
	Hosur Cattle Farm *	5·8	...	45·2	Hills.	Kodaikanal	11·5	+3·2	64·8
	Coimbatore Town	4·2	+0·4	26 0		Coonoor	16·0	...	55·4
	Coimbatore Res. Inst. *	7·2	+2·5	29·7		Ootacamund *	7·0	+2·1	55·2
	Trichinopoly	9·8	+4·2	39·5		Nanjanad *	5·5	+1·3	61·0
						Kallar *	13·8	+2·6	51·2

* Meteorological stations of the Agricultural Dept.

Summary of weather conditions: The depression which at the end of last month was approaching the Circars coast, crossed near Cocanada on the 2nd and moving inland, recurved to the north-east and disappeared over Assam on the 7th. A second depression appeared in the Bay centred about 10°N and 85°E on the 11th. It intensified into a storm and moving first northwards, recurved along the Circars coast and after weakening into a depression crossed into southeast Bengal on the 15th and disappeared over North Burma on the next day. A third depression formed in the south of the Bay on the 22nd and after developing into a storm on the next day moved in a northwesterly direction, crossed the Coromandel coast after weakening into a depression on the 26th and drifting westwards persisted as a diffuse area of low pressure over the east Arabian sea till the 30th. The interval between the second and third depressions was marked by thunderstorm activity over the peninsula with widespread rain. The first depression gave rise to very heavy rain in the Circars from Cocanada northwards. The second failed to influence the weather to any marked degree beyond causing a withdrawal of rainfall over the greater part of the area, and a few falls occurred on the Ganjam coast. The third depression caused widespread and locally very heavy rainfall over the south of the peninsula.

Rainfall was above normal over the whole area, and was in very large excess in the coastal districts of Vizagapatam, Ganjam, Tanjore, South Arcot, Chingleput and Travancore. The chief falls were: Berhampore 9·3″, Gopalpore and Vizagapatam 5·9″ each (2nd); Coonoor 4·1″ (7th) Trivandrum 5·2″ and Negapatam 5·1 (24th); Negapatam 12·2″ Aduthurai 8·0″ and Cuddalore 5·5″ (25th).

Weather Report for the Research Institute Observatory :

Report No. 11/32.

Absolute maximum in shade	87·2°
Absolute minimum in shade	63·9°
Mean maximum in shade	83·4°
Departure from normal	−1·4°
Mean minimum in shade	69·1
Departure from normal	+0·9
Rainfall during month	7·20″
Departure from normal	+2·91″
Heaviest fall in 24 hours	2·96″
Number of rainy days	9
Mean daily wind velocity	0·6 M. P. H.
Mean 8 hrs. wind velocity	1·2 M. P. H.
Mean humidity	87·3%
Total hours of bright sunshine	161·3
Mean daily hours of bright sunshine ...	5·4

General weather conditions : Rainfall was heavy and above the normal, but was of a local character and occurred in connection with thunderstorms. A severe thunderstorm gave a very heavy fall of 2·96″ on the night of the 4th; on the same night the fall in the town was only 0·8 inch. Temperature was nearly normal.

P. V. R. T. S. L.

Departmental Notifications.

I Circle. G. Sitharama Sastri, A. D. Vizagapatam L. A. P. for one month from 3—1—33 with permission to prefix Xmas and New year holidays. K. Suryanarayana A. A. D. Anakapalle, L. A. P. for one month from 7—1—1933. P. V. Sambasiva Row, A. D. Ellore L. A. P. for 8 days from 16—13—32 with permission to affix Xmas holidays. **II Circle.** M. P. Narasimha Rao. A. D. Kaikalur, L. A. P. from 10—12—32 to 22—12—'32 with permission to affix Xmas holidays. P. Gopalaratnam Cotton Assistant, Guntur, L. A. P. for 19 days from 3—1—33 with permission to avail Xmas holidays **III Circle. IV Circle.** P. S. Venkuswami Iyer A. D. Madurantakam, L. A. P. for 4 days from 30—11—32 to 3—12—32 A. Ramaswamy Iyer, A. D. Villupuram L. A. P. for one month from 3—1—33 with permission to avail Xmas holidays. R. Narasimha Iyer A. A. D., L. A. P. for one month from 23—11—32 with permission to suffix Xmas holidays. K. Ramanujachari, F. M. Kalahasti L. A. P. for 21 days from 3—1—33 with permission to prefix Xmas holidays. P. S. Venkuswamy Iyer, A. D. Madurantakam L. A. P. for 3 months from 3—1—33 with permission to prefix Xmas and New year holidays **V Circle** T. R. Venkaswami Rao, A. D. Tiruvalur, L. A. P. for 29 days from 24—11—32 with permission to affix Xmas and New year holidays. L. K. Narayana Iyer. A. A. D. Shiyali, L. A. P. for 29 days from 24—11—32 with permission to affix Xmas and New year holidays. **VI Circle.** M. K. Nambiar, Assistant Director of Agriculture, Madura expired on the morning of 6th December 1932. **VII Circle.** A. Gopalan Nair, F. M., Taliparamba L. A. P. for 3 months in continuation of Xmas holidays. **VIII Circle.** M. Subramania Pillai, A. D. Tirupur, L. A. P. for one month from 3—1—33 with permission to prefix

Xmas and New year holidays. V. Satagopa Iyangar A. D. Coimbatore, l. a. p. for 3 months from 3—1—'33 with option of taking one month leave at a later period and also permitted to prefix Xmas & New Year Holidays T. A. Rangaswamy Iyangar, A. A. D. Namakal, l. a. p. for 5 days from 27—10—'32. S. Ramaswamy, A. D Udamalpet, l. a. p. for 17 days from 22—10—'32. **G. E's Section.** K. R. Ramamurthi Artist l. a. p. for 22 days from 11—11—'32. M. S. Kailasam Asst. l. a. p. for 11 days from 2—11—'32. **Curator, Govt. B. Gardens.** K. Krishna Hegde, A. F. M. l. a. p. for 6 days from 22—12—'32 with permission to avail Xmas & New Year holidays. **Principal's Office.** V. Viswanathan, A F. M. Central Farm l. a. p. for 1 mot h and 10 days from 10—11—'32. K. K. Raghavan, F. M. Central Farm, l. a. p. for 11 days from 12—12—'32 with permission to avail Xmas holidays. **Paddy Section.** S. Ramanujam, Asst. l. a. p. for a fortnight from 21—11—'32. T. Lakshmipathi Rao, F. M. Maruteru l. a. p. for 17 days from 10—11—'32. **G. A. C's Section.** C. Raghavendra Char, Asst. l. a. p. for 10 days from 21—11—'32. **D. A's Office Orders.** K. Brahmachari, Entomology Asst. l. a. p. from 2—11—'32 to 22—12—'32 with permission to suffix Xmas & New Year holidays. Muhamad Moinuddin, appointed Offg. Asst. in his place. M. Chinnaswami Naidu, A. D, Peddapuram, on expiry of leave, transferred to **VIII Circle**, The services of K. Achutan Nair, A. D, have been dispensed with. *Promotions* S. N. Chandrasekhara Iyer, Asst. Lecturer Botany, from II to I grade from 1st Sept. 1932. K. M. Thomas Asst. to G. M. from III to II grade from 1st Sept. 1932. P. Subrahmanian, A. D. Siruguppa from II to I grade from 1st April 1932, K. Kunhappa Nambiar, Asst. Lecturer Agriculture, from III to II grade from 1st April 1932. As per Scheme for Co-operative groundnut marketting accepted by Cuddalore Loan & Sale Society, the following officers are posted as Warehouse Officers, 1. M. R. Ry. P. Janakirama Iyer at Tirukoilur, 2. M. R. Ry. K. S Krishnamurti Iyer at Cuddalore O. T.

ADDITIONS TO THE LIBRARY DURING OCTOBER 1932.

A Books.

(1) *The Open Pen System of White Sugar Manufacture*, R. C. Srivastava. (1932) (2) *Outlines of Agricultural Economics*, (Revised Edition), H. C. Tayler. (1931). (3) *New Jersey's Agricultural Experiment Station*—1880—1930 (Fifty years progress). Woodward C. R. and Waller I. N. (1932). (4) *The Thirsty Earth: A Study in Irrigation*. Carrier E. H. (1928). (5) *Madras Detailed Standard Specifications for use in the P. W. D.* (1931). (6) *Tamil Equivalents of English Terms in History, Economics, Administration, Politics and Civics*, (1932). (7) *Tamil Equivalents of English Terms in Chemistry*. (1932). (8) *Indian Finance Year Book*. (1932).

B Reports.

(1) Statistical Tables relating to Banks in India. 1930. (2) Annual Report of the Coffee Scientific Officer, 1931—32. Dept. of Agri. Mysore. (3) Annual Reports on Experimental Farms—Akola and the Experimental Farm attached to the Agricultural College, Nagpur, for the year ending 31st March 1931. C. P. & Berar. (4) Annual Reports of Experimental Farms of the Southern and Eastern Circles (Tharsa and Raipur) for the year ending 31st March 1931. (5) Annual Report of the Department of Agriculture, 1931. Nyasaland Protectorate. (6) Annual Report of Department of Agriculture, 1931. Kenya Colony and Protectorate. (7) Report on the Agricultural Department Antigua, 1931—32. (8) Administration Report of the Director of Agriculture for the year 1931. British Guiana. (9) Annual Report

of the Extension Work of Wisconsin, 1930—31. *New Jersey Publications:* (10) Annual Report of New Jersey Experiment Station and Agricultural College for the year 1930. (11) Annual Report of New Jersey Experiment Station and Agricultural College for the year 1931. (12) Annual Report of the Department of Biology, 1929—30. (13) Annual Report of the Department of Sewage Disposal for the year 1928—29. (14) Annual Report of the Department of Sewage Disposal for the year 1929—30. (15) Annual Report of Water Supplies and Sewage Disposal, 1930—31. *Louisiana State University Publications:* (16) Report of the Agricultural Experiment Station for the years 1929—1931. (17) Biennial Report of the Rice Experiment Station, 1930—31, Crowley, Louisiana. (18) Annual Report of the North Louisiana Experiment Station. 1931. (19) Biennial Report of the Northeast Louisiana Experiment Station, 1930—31. (20) Report of the Fruit and Truck Experiment Station, Hammond, 1931. (21) Report on Higher Education in the State of New York for the School year ending July 1930. (22) Annual Report of the Statistics Branch, 1931 of Ontario Department of Agriculture. (23) Annual Report of the Royal Botanic Garden and the Gardens in Calcutta and of the Lloyd Botanic Garden, Darjeeling for the year 1931—32.

C. Bulletins, Memoirs, etc.

(24) The Potato Epilachna Beetle. Mys. Agri. Dept. Ent. Bull. No. 9. *Concrete Associations of India publications*: (25) Concrete Floor Finishes. (26) The Overseer's Manual for Concrete Road Construction, (27) The Elements of Concrete Making. (28) Concrete Fences and Gate Posts. (29) Cement Plastering. (30) Small Concrete Tanks and How to Build Them. *Ministry of Agriculture and Fisheries Publications*: No. 41. Weeds of Grass Land. No. 53. Cabbages and Related Green Crops. No. 54. The Rearing of Chickens. No. 55. Salad Crops. *Empire Marketting Board Publications*: No. 59. The Storage of Tropically-Grown Tomatoes. No. 60. Control of Wastage in Bananas with Special reference to Time and Temperature Factors. No. c/4, Oil Seeds and Vegetable Oils. (38) Factors affecting the price of Potatoes in Great Britain. Cam. Dep. Agri. F. B. Rep. No. 15. (39) The Seasonal Distribution of Farm Labour Requirements. Rep. No. 14. (40) Interpretation of Farm Accounts. Cam. Dep. Agri. Far. Bull. No. 1. (41) Insects of Coconuts in Malaya. F. M. S. Dep. Agri. No. 10 1932. (42) Dairy Farming. U. S. Afr. Dep. Agri. Bull. No. 3. (43) Virus Diseases of Tobacco in Nyasaland. Nya. Pre. Dep. Agri. Bull. No. 2 (New Series). (44) Tea Yellows Disease. Nya Bul. No 3 (New Series). (45) Citrus Black Fly. Jam. Dep. Sci. & Agri. Ent. Bull. No. 6. (46) The Sugar Industry of the British West Indies and British Guiana with Special Reference to Trinidad, *Trin. Trop. Agri. Mem. Econ. No. 1.* (47) Macrophomina Phaseoli (Maub.) Ashby, in Trinidad. Trin. Myco. Ser. No. 4. (48) Watering and Spacing Experiments with Egyptian Cotton *Egy. Min. of Agri.* of Bull No. 112. *Cornell Agri. Expt. Stn. Publications:* No 533. A Satistical Analysis of the Results of Breeding High-Line and Low-Line Leghorns. No. 537. The Chemical Composition of the Muck Soils of New York. No. 538. Soil and Field-crop Management of Cayuga County, New York. *Arkansas Agri. Expt. Stn. Publications:* No. 274. Relation of Grade and Staple Length of Cotton to Prices Received by Farmers in Local Markets of Arkansas. No. 275. Relation of Central Market Prices of Strawberries to Production Planning. No. 276. Studies in the Design of Kitchens and Kitchen Equipment. No. 277. Preliminary Report on the Effect of Certain Chemicals on Rice Production and their Effecton the Rice Soil. No. 278. Studies of Wheat Varieties, Culture and Election. *Virginia Agri. Expt. Stn. Technical Bulletins:* No. 44. A Study of Lymphomatosis of Fowls. No. 285. Marketting Virginia Tobacco. No. 286. An Economic Study of Comparative Buying and Selling among Farmers in Virginia. *Oklahoma Agri. Expt. Stn. Bulletins:* No. 203. Factors Affecting The Accumulation of Nitrate Nitrogen in High Plains Soils. No. 204. Preliminary

Experiments in the Transmission of Anaplasmosis by Horseflies. *Kentucky Agri. Expt. Stn. Bulletins*: No. 314. The Effect of Soil Reaction on the Growth of Tomatoes and Lettuce and on the Nitrogen, Phosphorus, and Manganese Content of the Soil and Plant. No. 318. Adaptability of Red Clovers from different Regions, to Kentucky. No. 319. Organisation and Management Problems of Co-operative Strawberry Marketing Associations in Kentucky. No. 320. Studies on Shigella Equirulis. No. 321. Effect of Hydrogen-ion Concentration on the Growth of Strawberries in Sand and Soil, No. 322. Report on Soil Experiment Fields. No. 323. Some Factors Affecting the Price of White Burley Tobacco. No. 324. An Analysis of Clover Failure in Kentucky. *Massachussets Agri. Expt. Stn. Bulletins.* No. 282. Relation Between Egg, Quality and Price. No. 283. Downy Mildew of Cucumbers. No. 285. The Relation of Temperature to the Activity and Control of the Plum Curculio in Apples. No. 286. Types of Intensity in Rhode Island Reds. *Minnesota Agri. Expt. Stn. Technical Bulletins*: No. 67. Studies on the Nature of Physiologic Resistence to Puccinia Graminis Tritici. *Colorado Agri. Expt. Stn. Bulletins*: No. Potato Growing in Colorado. No. 324. The Effect of Green Manures and Crop Residues on Soil Reaction. No. 340. The Climate of Colorado. No. 374. Improvement of Home Grounds in Colorado. *Ohio Agri. Expt. Stn. Bulletins.* No. 499. Growing of Greenhouse Tomatoes. No. 500. Spraying Program and Pest Control in the Orchard. (81) Studies on the Changes in Nectar Concentration produced by the Honeybee, Apis mellifera, Part I. Iowa, A. E. S. Bull. (Res). No. 151. *Michigan Agri. Expt. Stn. Publications:* Technical Bulletin No. 121. (82) Fermentation Studies with Soft Wheat Flowers. No. 122. The Dissociation of Salmonella Pullorum and Related Species. No. 123. The Diagnosis of Brucella Infection in Animals and Man by Rapid Macroscopic Agglutination. *Special Bulletin* No. 220. Comparisons of Methods of Making Spray Applications. No. 221. Controlling the Codling Moth in Southwestern Michigan. No. 222. Garden Roses. No. 223. Bald Rock Wheat. No. 224. Marl—Its Formation, Excavation, and Use. No. 225. Spinach Varieties. *Circular Bulletin* No. 141. Some Chewing Insects Infesting Michigan Evergreens. No. 142. Common Diseases of Cereals in Michigan. No. 143. The Construction and Management of Aircooled Storages with Special Reference to Apples. Recreation as a land use. Wiscon. A. E. S. No. 422. *Ontario Dep. Agri. Bulletins:* No. 300. The Care of Farm Implements and Tools. No. 351. Insecticides, Fungicides and Herbicides. No. 352. Potatoes. No. 353. Rose Culture. No. 356. Insects Attacking Fruit Trees. No. 364. Manures and Fertilizers-Their. Use in Ontario. *New Fersey Agri. Expt. Stn. Bulletins:* No. Development and Ripening of Peaches as Correlated with Physical Characteristics, Chemical Composition, and Histological Structure of the Fruit Flesh; No. 575. 1. Physical Measurements of Growth & Flesh Texture in Relation to the Market and Edible Qualities of the Fruit. No. 507. 2. Histology and Microchemistry. No. 494. 3. Macrochemistry. No. 496. Effect of Chemicals Upon the Behaviour of Mosquitoes. No. 497. Experiments with Turf Grasses in New Jersey. No. 498. The Influence of Lime in Vegetable Growing. No. 499. Some Effects of Potassium Deficiency on the Histological Structure and Nitrogenous and Carbohydrate Constituents of Plants. No. 500. Action of Enzymes on Sewage Solids. No. 501. Effect of Fertilisers on Cranberry Land. No. 504. Increasing the Color of Cranberries after Removal from the Vines. No. 509 Premature Heading of Cauliflower as Associated with the Chemical Composition of the Plant. No. 510. Some Studies on the Larvel Parasites of the Oriental Peach Moth (Laspeyresia molesta Busck). No. 511. Length of the Fruit Development Period of the Elberta and Some Other Varieties of Peaches. No. 512. Experiments with Alfalfa, Clover, Timothy for Hay in New Jersey. No. 519. Investigations Relative to the Use of Nitrogenous Plant-foods 1913—1927. No. 523. Trapping the Oyster Drill. No. 526. The Use of Ammonia and Nitrate Nitrogen by Certain Crop Plants. No. 527. A

Practical Poultry Breeding Improvement Program. No. 528. The Significance of Measurments of Quantity and Quality of Egg Yield. No. 531. The Sylvids and Flycatchers of New Jersey. No. 534. Farm Profits and Factors Influencing Farm Profits on 176 Dairy Farms in Hunterdon County. No. 537. Corn Varieties for Grain, Fodder and Silage. *Newgersey Extension Bulletins:* No. 78. Why Thin Your Woodlot. No. 80. Home Canning and Curing of Meats. No. 82. Proved Sires Profitable. No. 83. The Poultryman's Challenge—Raise Healthy Pullets. No. 84. The Present Dairy Situation in New Jersey. No. 85. The Home Vegetable Garden. No. 86. New Jersey Canhouse Tomato Production-Recommendations for 1931. No. 87. Modern Methods of Removing Spray Residues from Apples and Pears. No. 89. Dry-Cleaning at Home. No. 90. Improving Garden Soils. No. 91. Backyard Play. No. 92. Garden Fertilizers. No. 93. Milk Houses. No. 95. Spraying Recommendations for Home Orchards. No. 96. New Jersey Canhouse Tomato Production-Costs and Recommendations for 1932. No. 97. The Farm Vegetable Garden. No. 98. Canning Vegetables and Fruits For Winter. Amendment to Federal Food and Drugs Act and Requirements thereunder. U. S. Dep. Agri. S. R. A. F. D. No. 4 Notices of Judgment under the Food and Drugs Act. N. J. F. D. 19026—19075. U. S. Standards For Cleaned (Unshelled) Virginia Type Peanuts U. S. Dep. Agri. Bureau of Agri. Economics Issue April 8, 1932. Standards for Farmers' Stock Virginia Type Peanuts. August 13, 1932 Deterioration of Damp Wheat Stored in a Small Farm Bin and a Method of Drying Damp Wheat. Dep. Agri. Bureau Agri. Econ. Pub. Market News Service on Fruits and Vegetables. Auction Sales of Fruits and Vegetables in City Markets.

D. Leaflets, Circulars, Etc.

(148) Die-back Disease of Cashewnuts—West Coast. Mad. Agri. Dep. Leaf. 46. (149) Carnations. Min. of Agri & Fish. Ad. Leaf. No. 130. (150) Glanders and Farcy. 137. (151) Back Yard Poultry Keeping. Min. of Agri. & Fish. Ad. Leaf No. 138. (152) Mosaic and Allied Diseases of the Potato. 139. (153) Fowl Pox. 145. (154) Citrus Root-Stocks. Cyprus Gaz. No. 2242 (Agri. Sup. No. 51.) (155) Inoculate Legumes to improve the Crops and enrich the Soil Wiscon. Extn. Ser Cir. 252. (156) Why not Eggs? Spl. May (157) Moles and Their Control in Iowa. Iowa. A. E. S. Cir. No. 137. (158) Care and Management of Baby Chicks. New. Jers. A. E. S. Cir. 247.

E. Reprints and Translations.

(159) On the Development of the Ovules in Parthonocarpic angiospermic fruits (160) The Influence of Soil Moisture As a Factor of Growth.